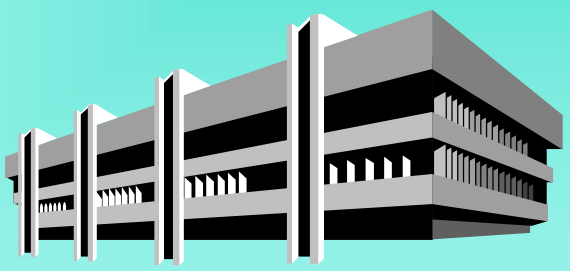
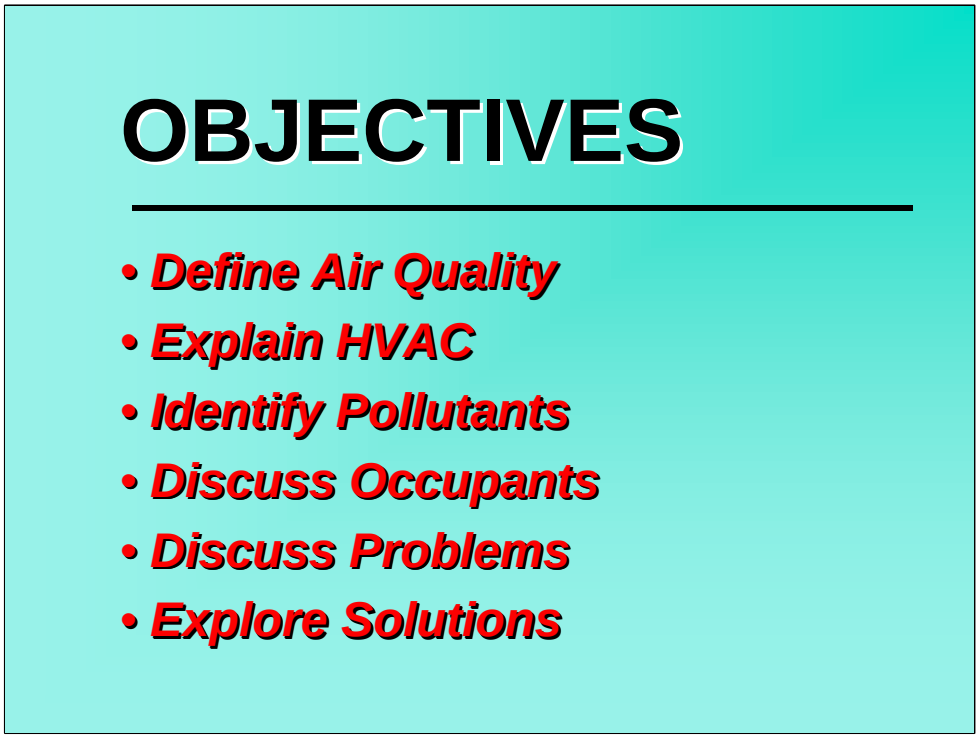
BUILDING AIR QUALITY



SD 1995 (Rev 01)

- **The purpose of this presentation is to discuss BUILDING AIR QUALITY and how it relates to tenants.**

- **Since most of us spend a large part our our work day in a facility, we need to understand how indoor air quality can affect our lives.**

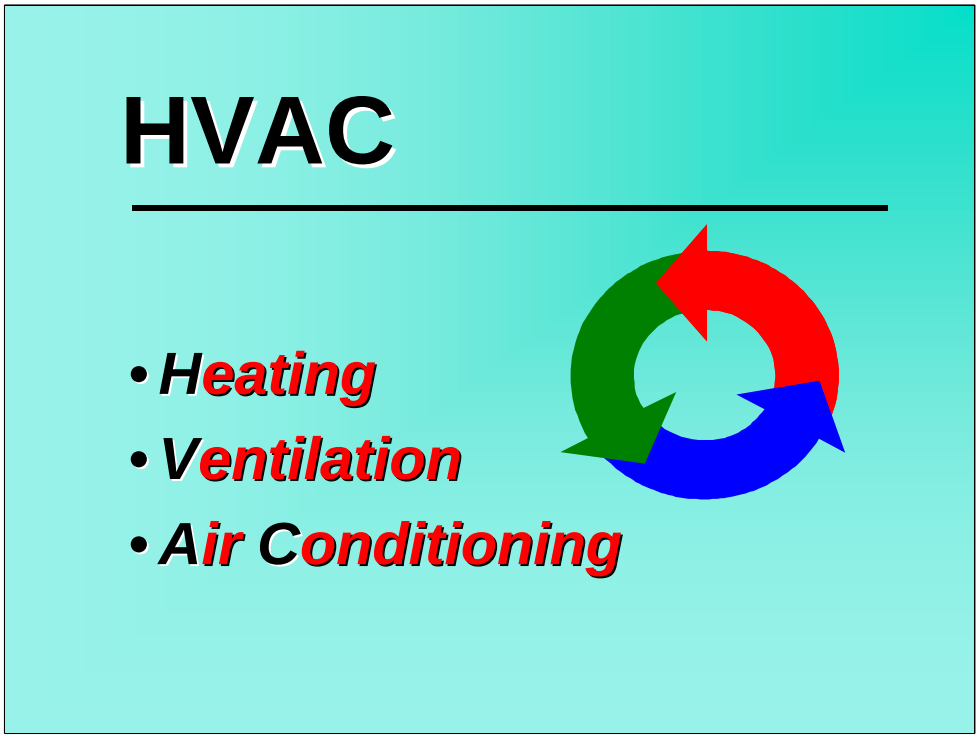


- **The objectives of this presentation are to:**

  Define building air quality,
  Explain building HVAC systems,
  Identify common air pollutants,
  Discuss the impact of occupants,
  Discuss air quality problems,
  And explore solutions to air quality problems.

- **First of all, lets start with a definition of air quality.**

- **Generally speaking, acceptable air quality in buildings requires a balance of: adequate air circulation, proper thermal comfort range, and air cleanliness.**
- **Adequate circulation provides for both the removal of spent air and the delivery of conditioned outside air. Without proper circulation, pockets of objectionable stale air develop which in turn can cause occupants to become sluggish and drowsy.**
- **The goal regarding thermal comfort is to maintain a range that is acceptable to a majority of occupants. Until recently, the federal government attempted to maintain a set temperature range in an effort to establish a reasonable compromise between energy conservation and occupant comfort. That policy has been relaxed and GSA is now able to provide a temperature based upon client desire.**
- **Air cleanliness is accomplished through the incorporation of filters which trap and remove pollutants from the supply air. Additionally, the specific location of outside air intakes and the surrounding outside air environment affects air cleanliness.**
- **The building system that controls circulation, temperature, and cleanliness is the HVAC system.**



• HVAC stands for: heating, ventilation, and air conditioning. This is the system that controls the environmental conditions within a space to benefit people, products, or processes.

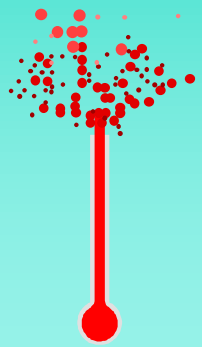
• The HVAC system consists of: heating, cooling, humidification, fans, filters, distribution, and control. The proper operation and maintenance of this system is of paramount importance to preventing air quality problems. (As many as 50% of IAQ problems can be traced back to the HVAC system.)

• Most HVAC systems recirculate a varying percentage of air (which if not properly managed can lead to elevated levels of carbon dioxide and complaints.).

• Many modern HVAC systems are managed by computerized control systems and it is not uncommon to both heat and cool different parts of a building simultaneously to maintain thermal comfort.

THERMAL COMFORT

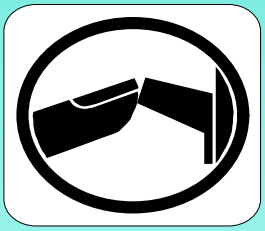
- ***Temperature***
- ***Humidity***



- **Thermal comfort (the combination of temperature & humidity) is maintained within a range that is acceptable to the majority of occupants.**
- **Each individual occupant has a different thermal comfort zone. Due to office configuration and system designs, it's not feasible to provide a temperature that meets the requirements of each and every individual.**
- **Therefore, individuals must also assume responsibility for their own comfort. Building temperatures are maintained within a range and beyond that personal clothing should be adjusted to maintain comfort.**
- **The temperature ranges most widely recommended are 68º F to 75º F in winter and 73º F to 79º F in summer.**
- **Humidity levels are maintained between 30-60 percent. Levels greater than 60 % provide conditions favorable to microbiological growth and conditions under 30 % can cause skin & mucous membrane irritation.**
- **Efficient operation of HVAC systems have been strained over the past 20 years due to nation wide efforts of energy conservation.**

ENERGY CONSERVATION

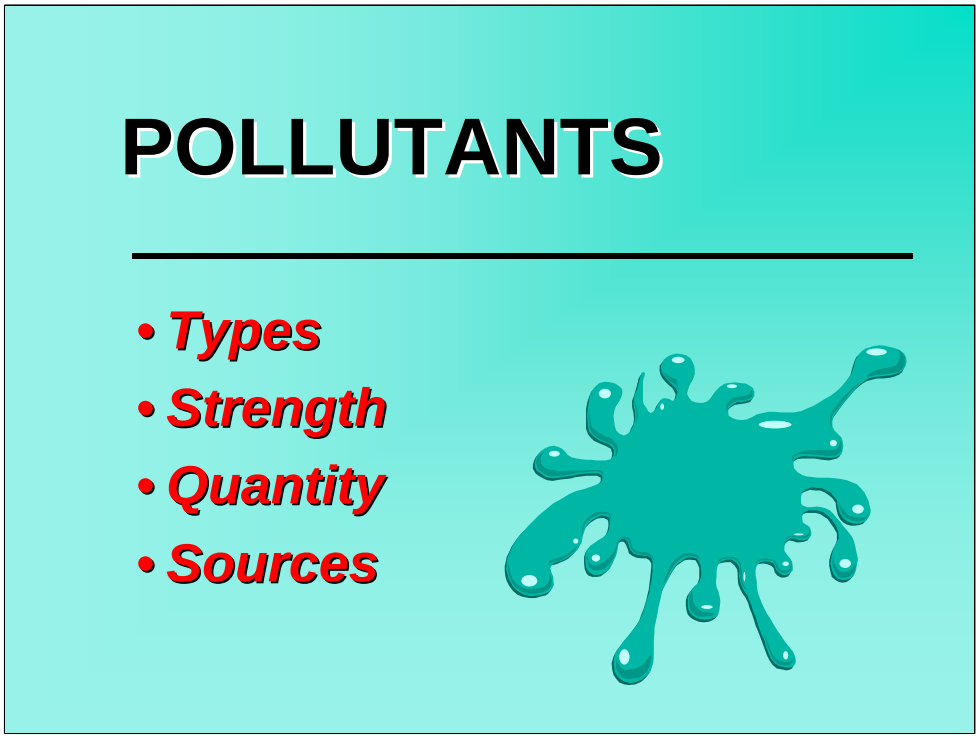
- ***Less outside air infiltration***
- ***Less pollutants escape***
- ***Less fresh air intake***



- **Energy conservation efforts have amounted to a double edged sword. While reducing energy and operation costs, these efforts have also complicated air quality management due to: less outside air infiltration, the escape of fewer pollutants, and less outside air intake.**

- **Along with energy conservation efforts, tighter building designs became prevalent in the late 70's. As a result, the term "tight building syndrome" was coined.**

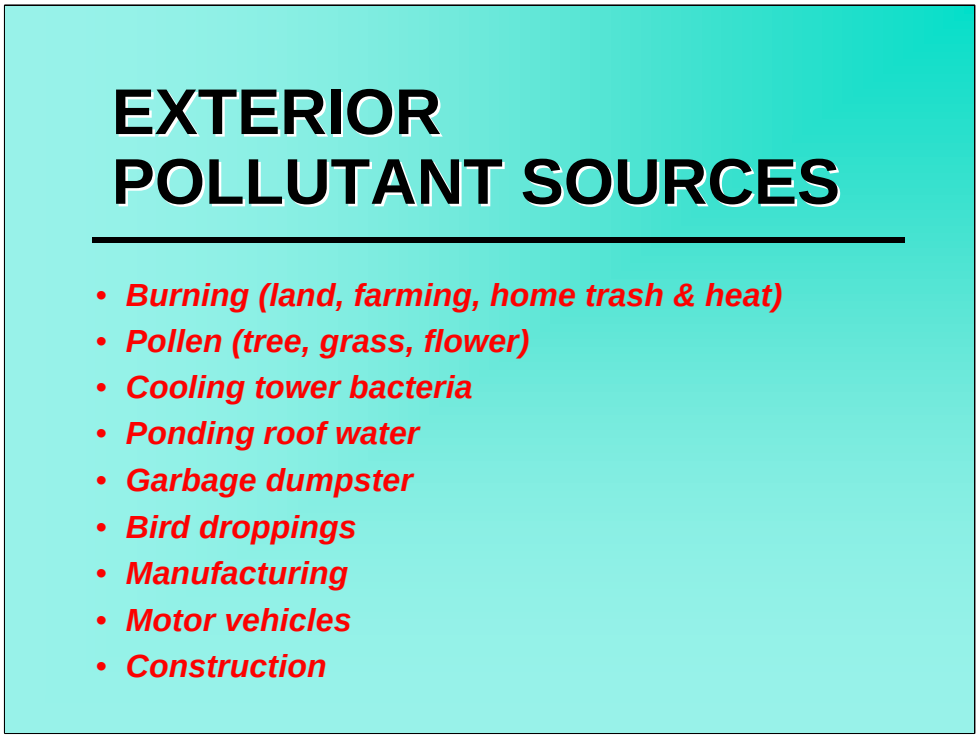
- **Tight buildings are also a contributor to indoor air quality problems.**



• **Another major factor in maintaining good building air quality is pollutant management. Pollutants are the physical, chemical, and biological agents which annoy or harm occupants when exposed.**

• **The low pollutant levels commonly found in buildings, can lead to problems, when occupants receive an increased dose due to exposure over an eight hour work day. Additionally, the exposure to several of these low level pollutants combined can lead to occupant discomfort.**

• **The list of pollutants which can contribute to air quality problems is quite long. These pollutants can be imported from outside the building or generated within.**

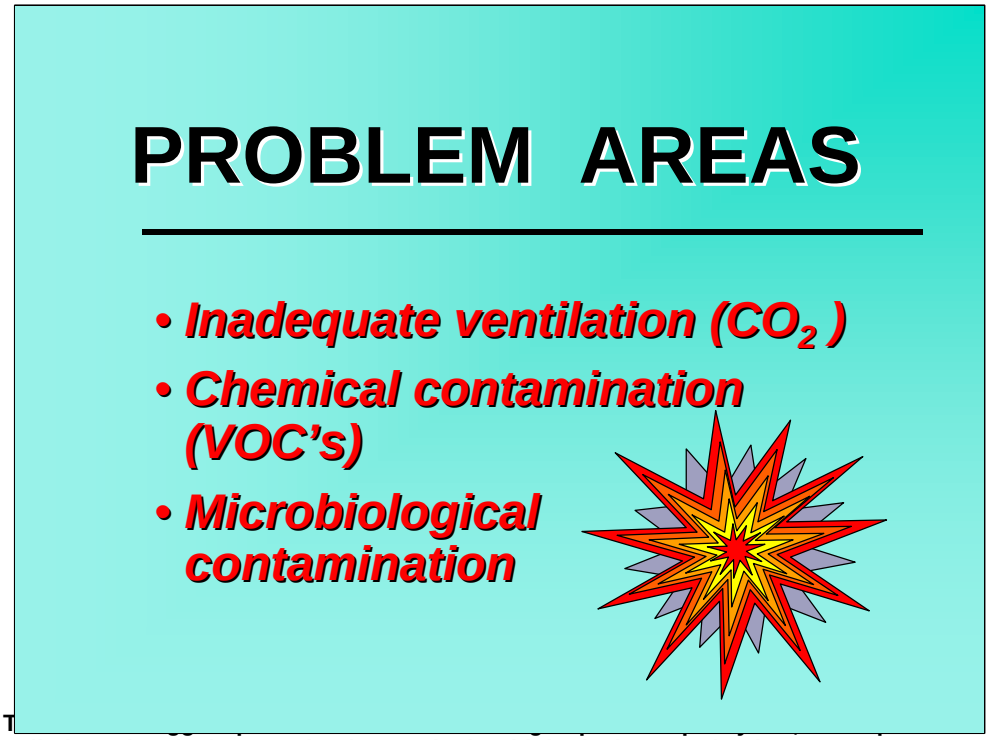


- **A few of the common exterior pollutant sources include . . .**

INTERIOR POLLUTANT SOURCES

- *People (cologne, body odor, illness, tobacco)*
- *Food (in desks, trash cans, lunch rooms)*
- *Office equipment (shredder, copy machines)*
- *Office products (white out, felt tip pens)*
- *Building maintenance*
- *Custodial practices*
- *Office furniture (VOC's)*
- *Parking garage (CO)*
- *Construction*

- **A few of the common interior pollutant sources include . . .**



• T… ventilation, chemical contamination, and microbiological contamination.

• Inadequate ventilation results in elevated levels of carbon dioxide. Building occupants produce CO_2 as a normal part of the breathing process. An elevated level of CO_2 can be an indication of a lack of outside air or too much indoor air recirculation. Elevated levels of CO_2 often make occupants feel tired and sluggish.

• Chemical contamination involves the off gassing of volatile organic compounds (commonly known as "VOC's"). This off gassing emits chemicals like formaldehyde from such items as construction materials, furniture, office products & equipment, and cleaning compounds. Most manufacturers have either drastically reduced or completely removed the more objectionable chemicals from newer products. Elevated levels of VOC's can result in headache, eye, nose, or throat irritation, or respiratory problems.

• Microbiological contamination comes from fungi (such as molds and mildew), infectious agents (such as bacteria or viruses), living or once living organisms (such as dust mites or insect parts), and pollen. Two conditions are required to support growth of microbiological pollutants: moisture and nutrients. Proper building maintenance and good housekeeping will discourage the spread of these agents.

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OCCUPANTS

- *Equipment*
- *Supplies*
- *Activity*

- **Building occupants themselves can also be a contributor to poor air quality.**

- **Occupant equipment such as photo copy machines, computer laser printers, facsimile machines, and paper shredders make up a growing list of pollutants.**
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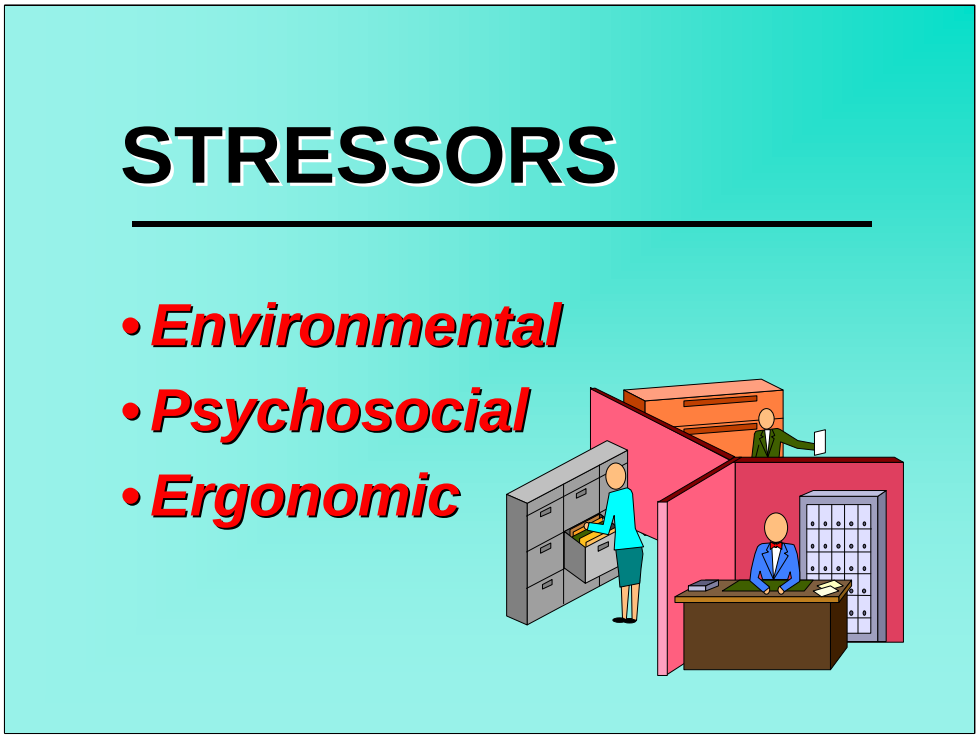
•Occupant office supplies such as white out and felt tip markers also emit pollutants.

•Occupant activities such as the use of strong perfume or cologne, smoking, disposing of food waste in office trash cans, and reporting to work when ill affects air quality.

•Another factor to be considered is the effect of stressors.



• Stressors are the environmental, psychosocial , and ergonomic conditions which annoy or harm building occupants.

• Environmental stressors can include lighting and noise levels.

• Psychosocial stressors can include over crowding, personnel conflicts, and labor/management problems.

• Ergonomic stressors can include workstation comfort and video display terminals.

• One of the most important factors of stressors is that they can often produce an increased sensitivity to pollutants. Stressors can also increase difficulties for occupants with certain medical conditions.

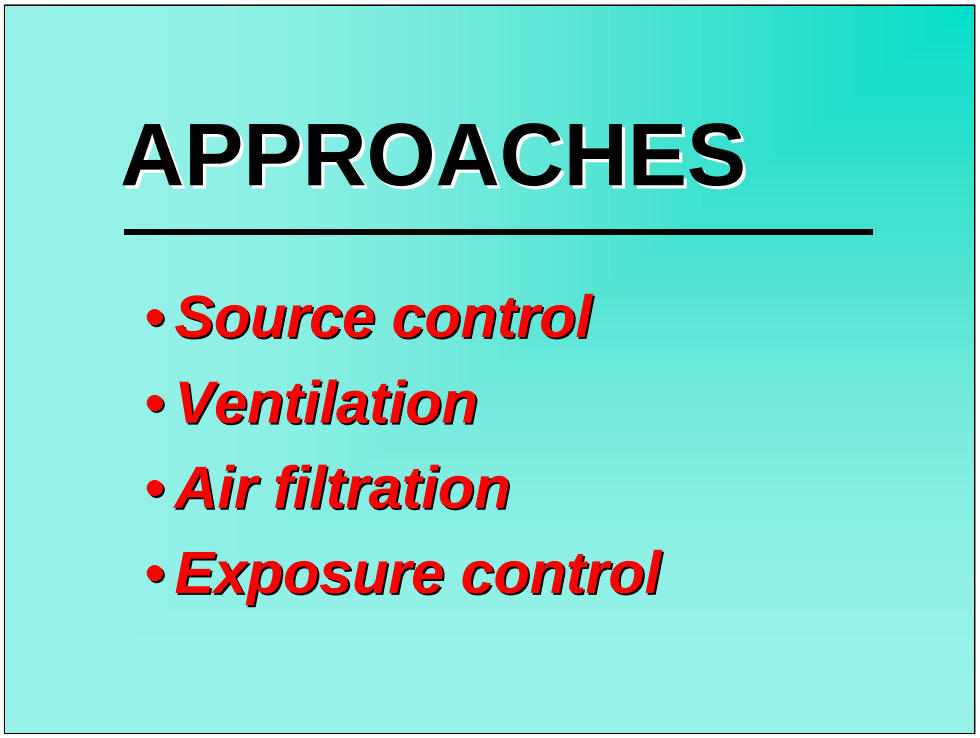
• **Occupants in good health are generally <u>not</u> affected by the low levels of pollutants typically found in buildings.**

• **Exceptions to this statement can include:**

Occupants with conditions such as allergies and chemical sensitivity,

Occupants with pre-existing diseases such as asthma or emphysema,

Occupants undergoing special medical treatment such as radiation or chemotherapy.



• **The most popular approaches to controlling pollutants are source control, ventilation, air filtration, and exposure control.**

• **Source control is generally considered to be the best long term strategy in the management of building air quality. Source control amounts to limiting, removing, sealing, or otherwise modifying the offending element.**

• **Ventilation, as previously discussed, can effectively be utilized to dilute or remove contaminants which have become air borne. (There is an old saying that "the solution to pollution is dilution.")**

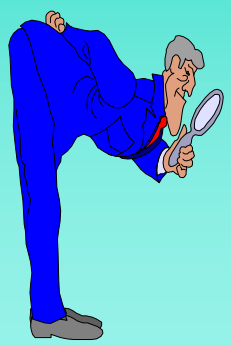
• **HVAC air filtration is generally a combination of devices utilized to reduce the concentration of airborne pollutants such as microorganisms, dusts, fumes, and other respirable particles. Typically, buildings located within metropolitan or industrial environments require increased filtering/cleaning than normal.**

• **And finally, exposure control involves adjusting the work hours or actual relocation of the affected occupant(s) to a less offensive environment. This is sometimes the most effective method when dealing with an individual who has a special medical condition such as severe asthma. (Exposure control is a strategy which is most appropriately employed between the affected individual occupant(s) and the employing agency.)**

- **What can occupants do about suspected indoor air quality problems?**
- **The affected employee should first contact his or her immediate supervisor or agency representative who should in turn should investigate the concern.**
- **If there appears to be a problem that is not within the agency's control to resolve, building management should be contacted. (Give the agency representative's name & telephone number for the building hosting this presentation).**
- **Examples of problems falling within an agency's sphere of influence might be: relocating an employee's workstation, relocating a noisy office machine, relocating a VOC emitting piece of equipment, providing ergonomic furniture, or removing/isolating offending occupant caused odors.**
- **Once building management has been notified, the wheels of the indoor air quality complaint system will be placed into motion.**
- **Additional information concerning the IAQ complaint system may be found in the JFB IAQ Management Plan which is available on the building website.**

RESOLUTION

- ***Investigation***
- ***Diagnosis***
- ***Correction***



- **GSA maintains a strong commitment to providing acceptable air quality within its buildings. <u>All</u> properly reported air quality complaints will be investigated.**

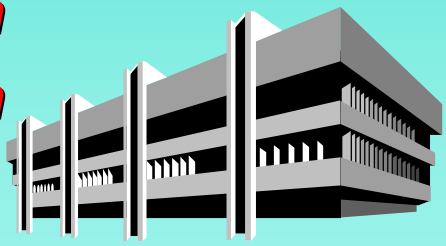
- **A few of the more common investigative techniques involve complainant interviews, site walk through, building equipment investigation, and sampling. Investigation strategies are generally be chosen on a case-by-case basis.**

- **Once the results of an investigation have been collected and analyzed, a determination of air quality should be possible along with a hypothesis for resolution.**

- **For those instances in which no correctable building related problem can be identified, GSA will work with the occupant agency to reach some resolution or accommodation. For those instances in which a building related cause has been identified, GSA will develop a plan, including time frames, for correction.**

SUMMARY

- *Air quality*
- *Pollutants*
- *Prevention*
- *Resolution*



- **In summary, we've seen that acceptable building air quality depends on; adequate air circulation, acceptable thermal comfort, and clean air, all of which are delivered by the building's HVAC system.**

- **Acceptable concentrations of most indoor air pollutants have not been established. Attempting to set acceptable exposure limits for the numerous individual air pollutants commonly found in office environments is generally viewed as impractical.**

- **Prevention is considered the best approach to maintaining good IAQ. This is accomplished by providing proper HVAC maintenance in addition to pollutant source control.**

- **Identification of poor air quality causes can be quite ellusive. Resolution of problems often involves a combination of investigative techniques, but does not always result in a clear and identifiable solution.**
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